

Patent Application 10/772,736  
Reply to Office Action dated February 28, 2006

Docket No. TSMC2003-0343. / 24061.80  
Customer No. 42717

### REMARKS

Claims 27-51 are pending in this application. Previously withdrawn claims 1-26 are canceled. Reconsideration of this application in light of the above amendments and the following remarks is requested.

#### **Rejection under 35 U.S.C. §112, First Paragraph, Claim 33-35, 37-38, 47-48 and 50-51**

Claims 33-35, 37-38, 47-48 and 50-51 are rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. The examiner states that claim 27 limits the interface between the first and second conductive layers to be substantially curvilinear whereas claim 34 limits the same interface to a substantially W-shape, and that the present application discloses in paragraph 24 that these are alternative profiles. The examiner further alleges that the profile cannot be alternate shapes at the same time. Applicants respectfully disagree.

Paragraph 24 of the present application states that "the recess 510 may have a curvilinear, substantially W-shaped or other undulating profile 520A." According to the Merriam-Webster dictionary, curvilinear is defined as "bounded by curved lines." Thus, a substantial curvilinear profile merely describes a profile that is substantially bounded by curved lines. The profile 520A shown in Fig. 5A is both curvilinear and substantially W-shaped. Applicants respectfully submit that the subject matter as recited in claims 33-35, 37-38, 47-48 and 50-51, which is supported by paragraphs 24-26 of the present application, enables a person of ordinary skill in the art to make and use different embodiments of the profile and that the rejection to claims 33-35, 37-38, 47-48 and 50-51 under 35 U.S.C. §112, first paragraph be withdrawn.

#### **Rejection under 35 U.S.C. §102(b), Claim 27, 36, 39-41, and 49**

Claims 27, 36, 39-41, and 49 are rejected under 35 U.S.C. §102(b) as being allegedly anticipated by Trivedi (US Patent No. 6,893,957). This rejection is respectfully traversed.

The PTO provides in MPEP § 2131 that

*"[t]o anticipate a claim, the reference must teach every element of the claim...."*

Therefore, with respect to claims 27 and 41, to sustain this rejection the Trivedi reference must contain all of the above claimed elements of the claim. However, contrary to the

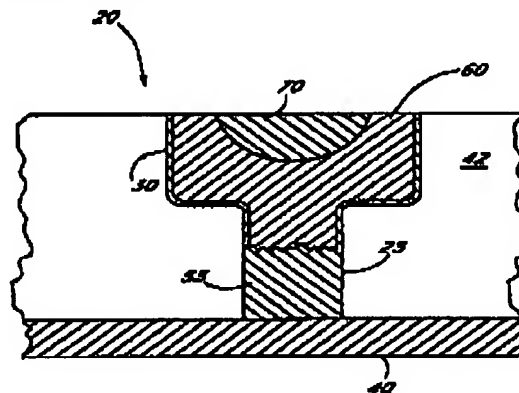
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examiner's position that all elements are disclosed in the Trivedi reference, the reference does not disclose "a dielectric layer overlying the first conductive layer and having an opening extending to the first conductive layer."

The examiner states in the office action that "Trivedi teaches a first conductive layer 60, a dielectric layer (parts of 42) overlying the first conductive layer and having an opening extending to the first conductive layer, a second conductive layer (70) located in the opening and contacting the first conductive layer, wherein the interface between the first and second conductive layer is curvilinear (figure 6). The examiner notes that ILD 42 represents two separate dielectric layers (column 4, lines 52-55)."

Fig. 6 of Trivedi is shown below:



**FIG. 6**

As shown in Fig. 6, dielectric layer 42 does not overlie the first conductive layer 60, as alleged by the examiner. Instead, the dielectric layer 42 surrounds the conductive layer 60. Therefore, Trivedi does not disclose "a dielectric layer overlying the first conductive layer and having an opening extending to the first conductive layer." In addition, the dielectric layer 42 does not have an opening extending to the first conductive layer. As shown in Fig. 6 above, the conductive layer 60 is located within the opening of the dielectric layer. The dielectric layer does not have an opening that extends to the conductive layer 60. Therefore, Trivedi does not disclose the features of claim 27 and 41.

Therefore, the rejection to claims 27, 36, 39-41, and 49 are not supported by the Trivedi reference and should be withdrawn.

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**Rejections Under 35 U.S.C. §103(a), Claims 28-30 and 42-44**

Claims 28-30 and 42-44 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Trivedi. Applicants traverse this rejection on the grounds that these references are defective in establishing a prima facie case of obviousness with respect to claims 27 and 41, from which claims 28-30 and 42-44 depend.

As the PTO recognizes in MPEP § 2142:

*... The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness. If the examiner does not produce a prima facie case, the applicant is under no obligation to submit evidence of nonobviousness...*

It is submitted that, in the present case, the examiner has not factually supported a prima facie case of obviousness for the following, mutually exclusive, reasons.

**1. The Reference Does Not Teach the Claimed Subject Matter**

Trivedi cannot be applied to reject claims 28-30 and 42-44 under 35 U.S.C. § 103(a) which provides that:

*A patent may not be obtained ... if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains ... (Emphasis added)*

Thus, when evaluating a claim for determining obviousness, all limitations of the claim must be evaluated. However, as described above in arguments presented for claims 27 and 41, Trivedi fails to disclose "a dielectric layer overlying the first conductive layer and having an opening extending to the first conductive layer." Instead, Trivedi discloses a dielectric layer that surrounds the conductive layer. Therefore, Trivedi does not disclose the features of claims 27 and 41, from which claims 28-30 and 42-44 depend.

Thus, for this mutually exclusive reason, the examiner's burden of factually supporting a prima facie case of obviousness has clearly not been met, and the rejection to claims 2, 4, and 7 under 35 U.S.C. §103(a) should be withdrawn.

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**2. The Combination of References is Improper**

Assuming, arguendo, that none of the above arguments for non-obviousness apply (which is clearly not the case based on the above), there is still another, mutually exclusive, and compelling reason why Trivedi cannot be applied to reject claims 28-30 and 42-44 under 35 U.S.C. § 103(a).

§ 2142 of the MPEP also provides:

*...the examiner must step backward in time and into the shoes worn by the hypothetical 'person of ordinary skill in the art' when the invention was unknown and just before it was made....The examiner must put aside knowledge of the applicant's disclosure, refrain from using hindsight, and consider the subject matter claimed 'as a whole'.*

Here, Trivedi fails to disclose or suggest, the desirability of the combination "a dielectric layer overlying the first conductive layer and having an opening extending to the first conductive layer"

Since Trivedi discloses a first conductive layer that is within the opening of the dielectric layer, Trivedi does not and could not disclose a dielectric layer that overlying the first conductive layer and having an opening that extends to the first conductive layer. Thus, it is clear that Trivedi fails to provide any incentive or motivation supporting the desirability of the combination. Therefore, there is simply no basis in the art for combining the references to support a 35 U.S.C. § 103(a) rejection.

In this context, the MPEP further provides at § 2143.01:

*The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.*

In the above context, the courts have repeatedly held that obviousness cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the combination.

In the present case it is clear that the examiner's combination arises solely from hindsight based on the invention without any showing, suggestion, incentive or motivation in either reference for the combination as applied to claims 27 and 41. Therefore, for this mutually

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exclusive reason, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection to claims 28-30 and 42-44 under 35 U.S.C. §103(a) should be withdrawn.

**Rejections Under 35 U.S.C. §103(a), Claims 31, 32, 45, and 46**

Claims 31, 32, 45, and 46 are rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over Trivedi in view of Wolf (page 684). Applicants traverse this rejection on the grounds that these references are defective in establishing a *prima facie* case of obviousness with respect to claims 31, 32, 45, and 46.

**1. Even when combined, the References Do Not Teach the Claimed Subject Matter**

The Trivedi and Wolf references cannot be applied to reject claims 31, 32, 45, and 46 under 35 U.S.C. § 103(a). In particular, neither Trivedi nor Wolf discloses "a diffusion barrier layer interposing the dielectric layer and the second conductive layer." The examiner admits that Trivedi does not disclose such features, but alleges that Wolf discloses such features on page 684. Wolf discloses in the reference that "a dielectric layer (here, undoped SiO<sub>2</sub>) is deposited by a CVD process to a thickness required for a via hole depth. . . . Then, the embedded etch-stop layer is deposited by CVD. . . . Finally, the inter-metal-dielectric stack (IMD) is completed by depositing a second dielectric film." Thus, Wolf deposits an etch stop layer between two dielectric layers instead of between a dielectric layer and a second conductive layer. Therefore, neither Trivedi nor Wolf discloses "a diffusion barrier layer interposing the dielectric layer and the second conductive layer," as recited in claim 31 and 45.

In addition, neither Trivedi nor Wolf discloses "a diffusion barrier layer interposing the first and second conductive layers and substantially conforming to the interface profile," as recited in claim 32 and 46. Wolf merely deposits an etch stop layer between two dielectric layers, not between two conductive layers. There is also no mention of an interface profile in Wolf. Therefore, neither Trivedi nor Wolf discloses the features of claims 31, 32, 45, and 46.

Thus, for this mutually exclusive reason, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection to claims 31, 32, 45, and 46 under 35 U.S.C. §103(a) should be withdrawn.

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**2. The Combination of References is Improper**

Assuming, *arguendo*, that none of the above arguments for non-obviousness apply (which is clearly not the case based on the above), there is still another, mutually exclusive, and compelling reason why the Trivedi and Wolf references cannot be applied to reject claims 31, 32, 45, and 46 under 35 U.S.C. § 103(a).

Here, Trivedi and Wolf, either alone or in combination, fail to disclose or suggest, the desirability of the combination "a diffusion barrier layer interposing the dielectric layer and the second conductive layer" or "a diffusion barrier layer interposing the first and second conductive layers and substantially conforming to the interface profile."

Since Trivedi fails to mention anything about a barrier layer, Trivedi does not and could not disclose a diffusion barrier layer interposing either the dielectric layer and the second dielectric layer or between the first and second conductive layers. While Wolf, on the other hand, discloses a diffusion barrier layer that is between two dielectric layers, Wolf does not disclose a diffusion barrier layer that is between two conductive layers or between one dielectric layer and a conductive layer. There is also no mention of an interface profile in Wolf, let alone a diffusion barrier layer that substantially conforms to the interface profile. Thus, it is clear that Trivedi and Wolf fail to provide any incentive or motivation supporting the desirability of the combination. Therefore, there is simply no basis in the art for combining the references to support a 35 U.S.C. § 103(a) rejection.

Therefore, for this mutually exclusive reason, the examiner's burden of factually supporting a *prima facie* case of obviousness has clearly not been met, and the rejection to claims 31, 32, 45, and 46 under 35 U.S.C. § 103(a) should be withdrawn.

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**Conclusion**

It is clear from all of the foregoing that independent claims 27 and 41 are in condition for allowance. Dependent claims 28-40 and 42-51 from and further limit independent claims 27 and 41 therefore are allowable as well.

An early formal notice of allowance of claims 27-51 requested.

Respectfully submitted,



Wing Y Mok  
Registration No. 56,237

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HAYNES AND BOONE, LLP  
901 Main Street, Suite 3100  
Dallas, Texas 75202-3789  
Telephone: 214/739-8626  
Facsimile: 214/200-0853  
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